



Safety for Electric vehicle

5th Oct. 2023

Nissan Motor Asia Pacific

Agenda

1. Global regulation and standard for EV
2. High reliable and performance EV – Beyond regulation
3. Other than vehicle development

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List of United Nations Regulation(UN R)

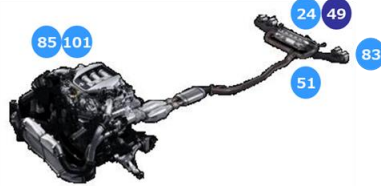
■ More than 160 UN regulations exist for most of parts and motor vehicles.

UN R No & TITLE

3. REFLEX REFLECTORS
 4. Rr REGISTRATION PLATE LAMPS
 6. DIRECTION INDICATORS
 7. POSITION LAMP, STOP LAMP
 10. RADIO INTERFERENCE SUPPRESSION
 11. DOOR LATCHES & HINGES
 12. STEERING MECHANISM
 13. BRAKING
 13H. BRAKING (M1)
 14. SAFETY BELT ANCHORAGES
 16. SAFETY BELTS
 17. SEATS
 19. Fr FOG LAMPS
 21. INTERIOR FITTINGS
 23. REVERSING LAMPS
 24. DIESEL SMOKE
 25. HEAD RESTRAINTS
 26, 61. EXTERNAL PROJECTIONS
 28. AUDIBLE WARNING DEVICES
 29. CAB (COMMERCIAL VEHICLE)
 30, 54. TYRES
 34. PREVENTION OF FIRE RISKS
 35. FOOT CONTROLS
 38. Rr FOG LAMPS
 39. SPEEDOMETER
 43. SAFETY GLAZING MATERIALS
 45. HEADLAMPS CLEANERS
 46. REAR-VIEW MIRRORS
 48. LAMP INSTALLATION
 49. DIESEL EMISSION
 51. NOISE

55. MECHANICAL COUPLING
 58. Rr UNDERRUN PROTECTION
 64. SPARE WHEELS/TYRES, RUN FLAT TYRE, TPMS
 66. STRENGTH OF SUPER STRUCTURE (LARGE PASSENGER VEHICLE)
 73. LATERAL PROTECTION (GOODS VEHICLE)
 77. PARKING LAMP
 79. STEERING EQUIPMENT
 80. SEAT (LARGE PASSENGER VEHICLE)
 83. EXHAUST EMISSION
 85. ENGINE POWER
 87. DAYTIME RUNNING LAMPS
 89. SPEED LIMITATION DEVICES
 91. SIDE-MARKER LAMPS
 93. Fr UNDERRUN PROTECTION
 94. FRONTAL IMPACT
 95. LATERAL IMPACT
 100. BATTERY ELECTRIC VEHICLES
 101. CO2 AND FUEL CONSUMPTION
 112. HEADLAMPS
 116. ANTI THEFT
 117. TYRE NOISE
 118. FLAME-RETARDANT IN INTERIOR
 119. CORNERING LAMPS
 121. TELL-TALES AND INDICATORS
 122. HEATING SYSTEM
 123. AFS
 125. FORWARD VISION
 127. PEDESTRIAN PROTECTION
 130. LDWS (HEAVY VEHICLE)
 131. AEBS (HEAVY VEHICLE)
 133. RECYCLABILITY

134. HFCV
 135. POLE SIDE IMPACT (PSI)
 137. FULL-LAP FRONTAL IMPACT
 138. QUIET ROAD TRANSPORT VEHICLES
 142. TYRE INSTALLATION
 144. ACCIDENT EMERGENCY CALL SYSTEMS
 151. BLIND SPOT INFORMATION SYSTEM
 152. AEBS (LIGHT VEHICLE)
 153. THE FUEL SYSTEM INTEGRITY AND SAFETY OF ELECTRIC POWER TRAIN IN THE EVENT OF REAR-END COLLISION
 154. WLTP
 155. CYBERSECURITY AND CYBERSECURITY MANAGEMENT SYSTEMS
 156. SOFTWARE UPDATE AND SOFTWARE UPDATE MANAGEMENT SYSTEM
 157. AUTOMATED LANE KEEPING SYSTEM
 158. REVERSING MOTION AND THE DRIVER'S AWARENESS OF VULNERABLE ROAD USERS BEHIND VEHICLE
 159. MOVING OFF INFORMATION SYSTEM FOR THE DIRECTION OF PEDESTRIANS AND CYCLISTS (MOIS)
 160. EVENT DATA RECORDER (EDR)
 161. THE DEVICE AGAINST UNAUTHORIZED USE (A LOCKING SYSTEM)
 162. IMMOBILIZER
 163. VEHICLE ALARM SYSTEMS
 164. STUDDED TYRES
 165. REVERSE WARNING SOUND (RWS)



リサイクル可能率 **%以上 133



*** : UN R (United Nations Regulation)

*** : UN R (Items which are also included in UN GTR)

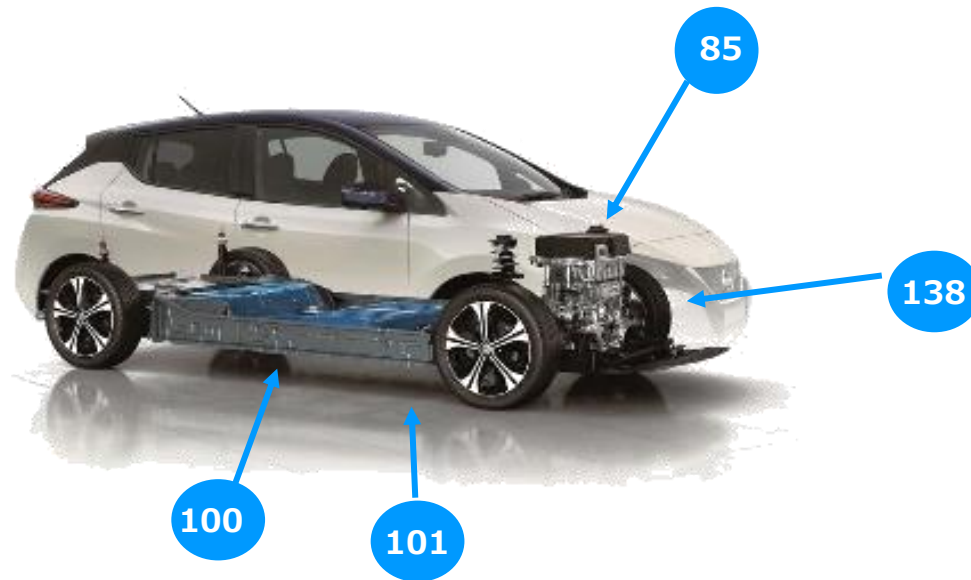
EV unique vehicle regulations



- There are several key regulations for EV safety

EV unique UN R No & TITLE

- 85.ENGINE POWER → **MOTOR POWER**
- 100.**BATTERY ELECTRIC VEHICLES**
- 101.CO2 AND FUEL CONSUMPTION → **Driving range & Electrical power consumption**
- 138.**QUIET ROAD TRANSPORT VEHICLES**



EV unique vehicle regulations



■ Key contents of UN R100 – Battery electric vehicles

- Protection against electric shock
- Crash test (with Vehicle or Battery)
- Rechargeable Electrical Energy Storage System (REESS) requirement
 - Thermal shock
 - Fire resistance
 - External short circuit protection
 - Over charge protection



■ Key contents of UN R138 – QUIET ROAD TRANSPORT VEHICLES

- Need to equip AVAS (Acoustic Vehicle Alerting System) for Quiet vehicles to alert vehicle is nearby you
 - When vehicle is 20km/h or less (Forward & Rear)
 - The sound must be different from natural phenomenon sounds

International standard for Quick Charging system

- Main Quick Charger protocol in the world
 - Safety concept to avoid misuse of charging is determined in these protocols.

	CHAdeMO	GB/T	US-COMBO CCS1	EUR-COMBO CCS2
Connector				
Inlet				
 	✓	✓	✓	✓
			SAE	
 	✓			✓
 	✓	✓	✓	✓
 GB		✓		
Protocol	CAN		PLC	
Start @	2009	2013	2014	2013

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High reliable and performance EV – Beyond regulation

Fire or major battery failures: 0

Over 350,000
Units*



Over 57.5
million cells*



Reliable under repeated charging and discharging
→ Capacity after 500 cycles

2nd generation LEAF

More than 90%

Conventional Lithium-ion
Battery

Approx. 70%

* Nissan internal study result

Lightning
strike test



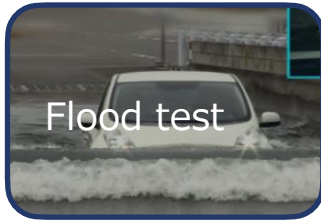
Impact test



Fire resistance
test



Flood test



Drop from 6m
onto 25cm curb
stone



High reliable and performance EV – Beyond regulation

Concept of CRASH SAFETY – HIGH VOLTAGE

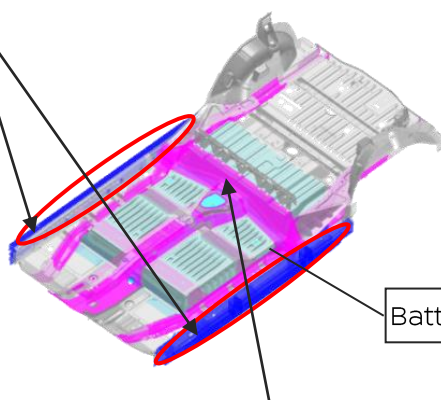
Many EV customers have concerns about collision when it comes to an EV.
Need to develop highly reliable EV to protect driver and passenger.



Battery protection structure

Impact Energy Absorbed Body

Control body deformation by impact energy absorbed body

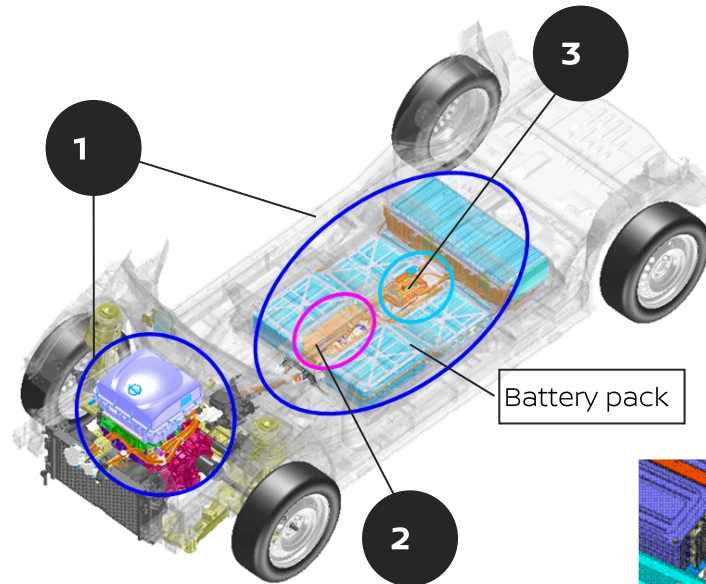


Battery pack

Protection Structure

Battery Pack is protected by body structure

High voltage protection design



Battery pack

1

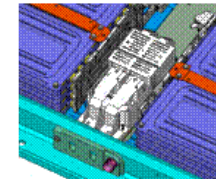
High voltage parts are protected by considered component layout and body structure.

2

High voltage is shut down by impact sensing system.

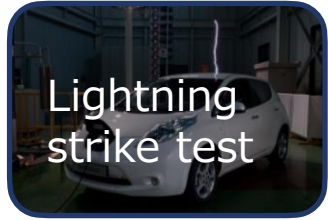
3

Short circuit is prevented by fuse in a battery pack



A high-voltage shut down device is set in a battery pack.

High reliable and performance EV – Beyond regulation



High reliable and performance EV – Beyond regulation



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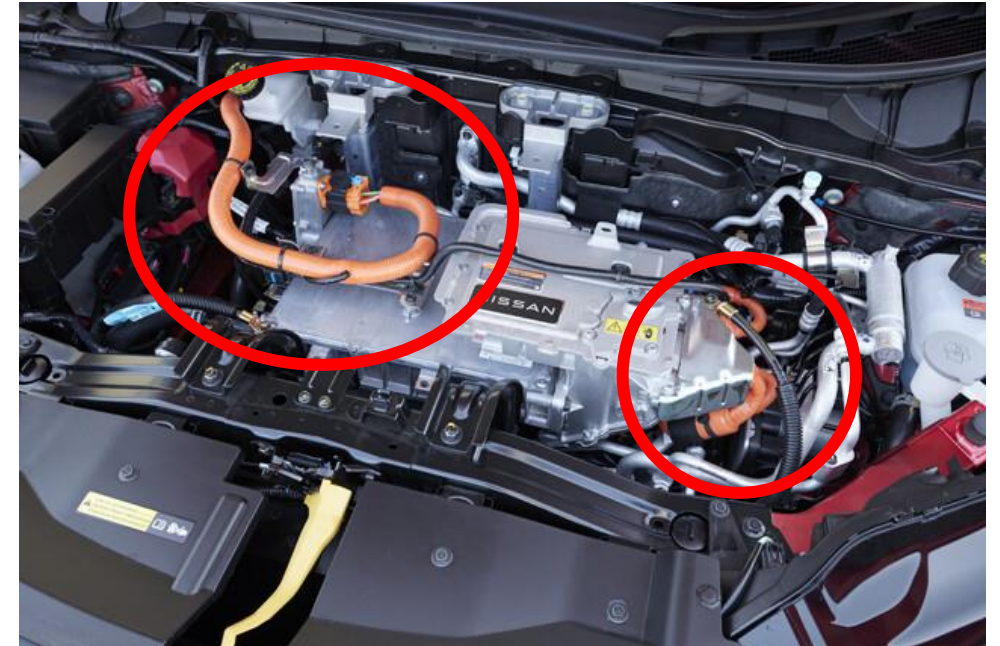
Safety for drivers

- Warning labels are set to eliminate any risk of electric shock
- High voltage harness is colored orange to visibly understand the caution

WARNING label for High voltage battery



High voltage harness with orange color

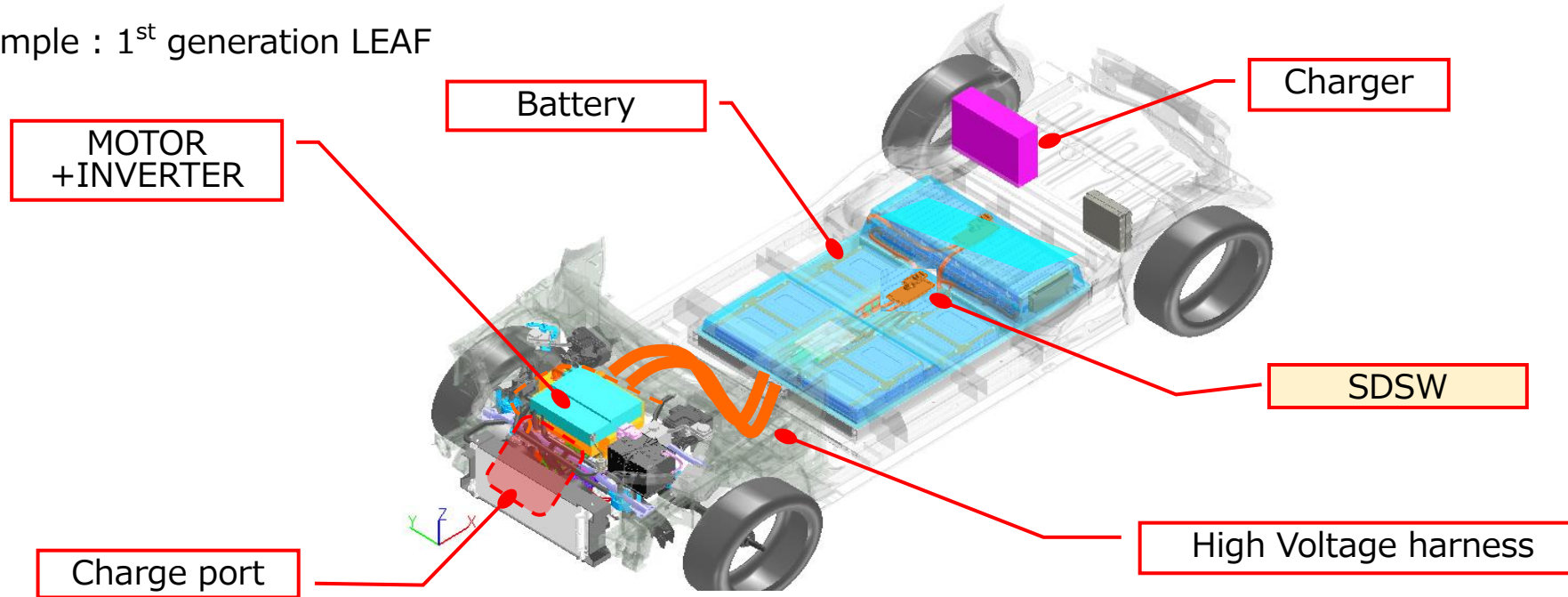


Safety for technicians

■ It's important to take care the safety for technicians of vehicle test and service maintenance

- Understand the high voltage parts layout
- Understand Service Disconnect Switch(SDSW) function
 - *SDSW : Switch to shut down the high voltage circuit for vehicle maintenance and/or rescue

Example : 1st generation LEAF



Safety for technicians

- It's important to take care the safety for technicians of vehicle test and service maintenance
 - Educate EV unique test method and instruments

<Special tools>

Electrically insulated gloves



Electrically insulated safety shoes



<Special method for vehicle test>

Instrument Preparation Before Test Phase	Normal Preparation Test Phase	After Test Check Post Test Phase
Battery Voltage Measurement	Sensor check	Insulation resistance check#1
Battery charge/discharge	Ready ON	Sensor/parts removal
Battery removal	Crash Test	Insulation resistance check#2
Sensor fitment	EV check	Battery removal
Battery re-install to car	Battery voltage measure	Battery check
Sensor Check	IGN Off	Move battery to storeroom
	SD switch	High voltage parts removal
		High voltage parts damage check

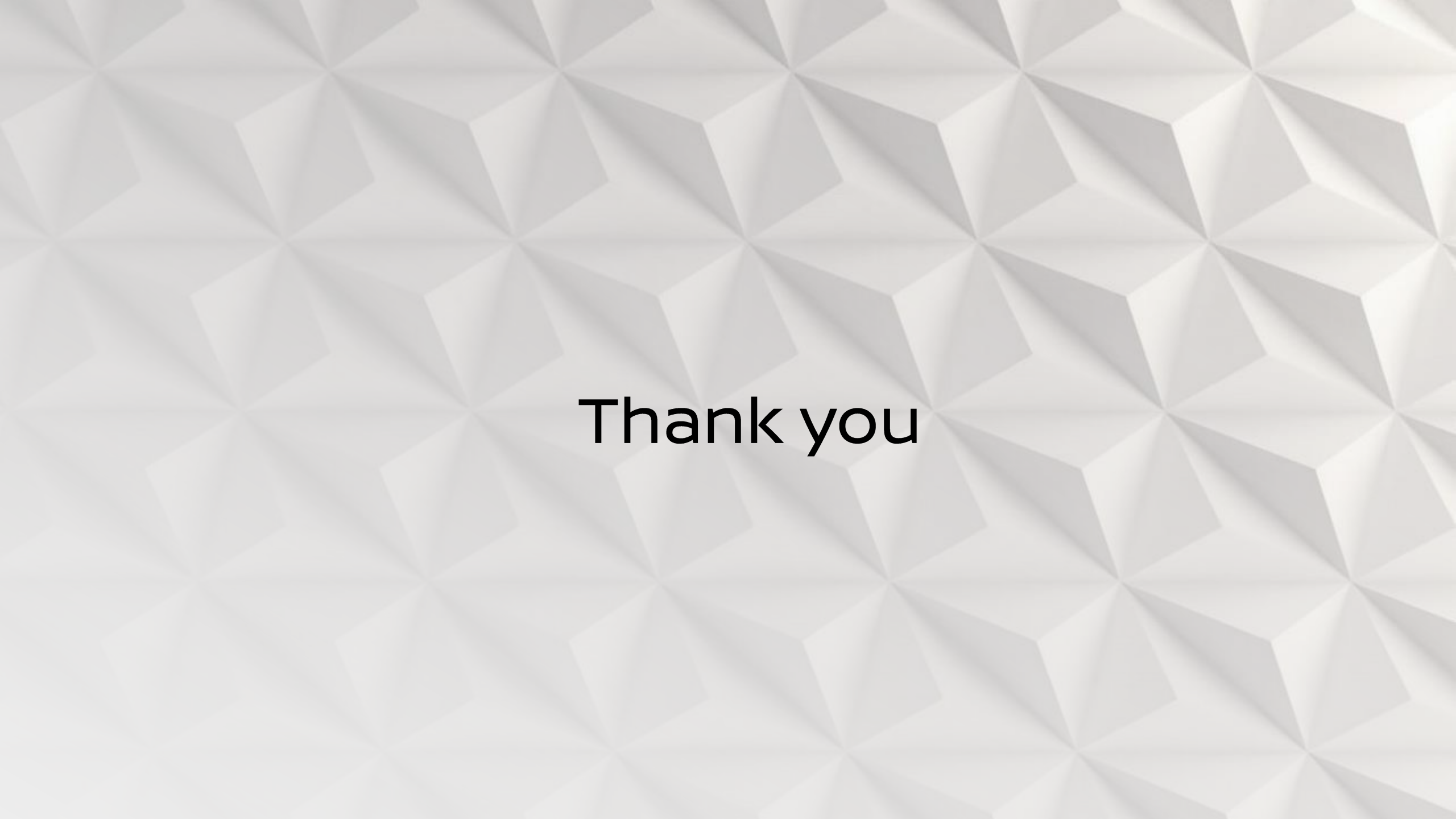
Key Notes

- ✓ There are several EV unique regulations / standards
- ✓ Think beyond regulation to develop reliable & safe EV
- ✓ Need to take care of drivers and technicians especially protecting from electric shock by high voltage parts

Zero Emission



T h a n k y o u !



Thank you